

## SOME CHARACTERISTICS OF TORNADES.

By ALFRED WEGENER.<sup>1</sup>[Abstracted from *Meteorologische Zeitschrift*, Sept.-Oct., 1918, pp. 245-249.]

For the benefit of those interested in tornadoes, the author has outlined some of the chief characteristics of European tornadoes, pointing out those points concerning which there is much to be learned. It appears that with relation to the frequency of thunderstorms, tornadoes are less frequent in the evening in spring than in the morning in autumn. They seem to be most frequent in the lee of mountain ranges or in river valleys. The American tornado is more destructive than the European, and five or six times as many deaths are ascribed to it.

Other elements, which are especially worthy of research are the direction of motion, speed of motion; length of path, and length of life of the formation. In Europe, more than half of all the tornadoes come from the west or southwest; and only one fourth from directions between north and southeast; they appear in general to travel to the left of the thunderstorm. The mean speed of the tornado is only 23 kilometers per hour, as compared with the 38 kilometers per hour of the thunderstorm. The length of path varies from almost 0 to 400 kilometers, but the most common path is from 1 to 10 kilometers, in length. In general, they last from 12 to 30 minutes. The extremes of duration are 5 seconds and 3 hours 20 minutes.

The width and curvature of path, the relation of the tornado's path to that of hail, the frequency of cyclonic and anticyclonic motions, the amount of pressure fall in the center, and the circumstances surrounding the formation of the whirl, are also pointed out as points upon which much information is needed. Photographic methods are recommended, whenever feasible, on account of the rapid motion and excitement attending the passing of such a formation.—C. L. M.

## TORNADES OF OCTOBER 8, 1919.

At 4:04 p. m. of October 8 a tornado struck Hoisington, a town of 2,000 population in Barton County, Kansas, and devastated a strip 400 feet wide through the business and main residence section, either partially or completely wrecking between 50 and 60 houses, and causing a total damage estimated at \$200,000. Twenty five persons were injured, three killed outright, and one died later from injuries incurred.

The storm formed three miles southwest of Hoisington. An eye witness, Mr. John Gruber, who was operating a thrashing rig two and a half miles southwest of Hoisington, stated that clouds from every direction started drifting toward a point half a mile to the southwest of him. The closer they came to this point the faster they moved until within only a few seconds they seemed to be racing with incredible speed. There was no whirling or circular motion until they had come together. After this occurred a terrible roar was heard, similar to that of a heavy freight train, and the whirl seemed to hover over the same spot for several seconds before the funnel shaped cloud lengthened sufficiently to reach the ground, when it headed toward the northeast, striking first the railroad Young Men's Christian

Association Building at Hoisington and the Van Noy Hotel, and then tearing a path directly to the northeast through the town. The force of the storm was apparently spent 5 or 6 miles northeast of Hoisington, though a cancelled check and other papers of Hoisington business houses were picked up the next day at Lincoln, 55 miles to the northeast.

Reports indicate that the funnel-shaped cloud was broader and lower than it usually is in such storms and the violence of the wind does not seem to have been as great as it sometimes is, since a large number of houses

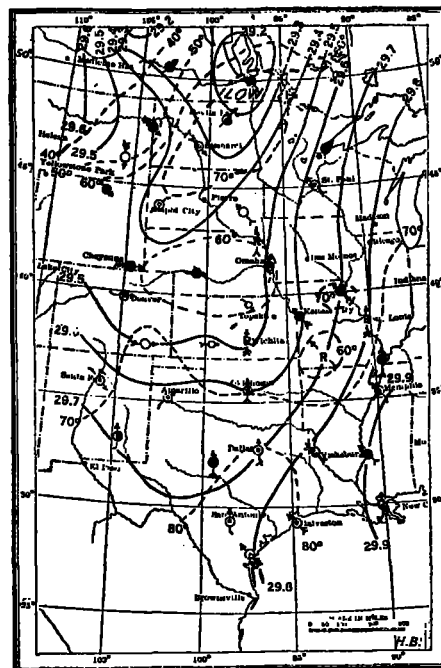


FIG. 1.—Tornadoes of Oct. 8.

directly in the storm path were merely injured by having the roof blown off or a side blown out instead of being completely destroyed.

The storm struck the town without warning, except for the heavy fall of rain and hail that preceded it. A few minutes after it passed the sky cleared and the sun was shining brightly.

Half an hour after the first storm a second tornado formed about 18 miles southwest of Hoisington, near the town of Dundee, and moved toward the northwest for 8 miles, disappearing 2 miles northwest of Great Bend. Several farm houses and buildings were wrecked, live stock were killed, and a fine orchard was ruined, but no one was injured and the total damage was comparatively small.—S. D. F. (from press reports).

NOTE.—Fig. 1, the weather map for 7 p. m., 90th meridian time, shows no temperature conditions at the surface which would indicate tornado weather. There must have been converging winds or a cold over-running wind aloft.—C. F. B.

## BALL LIGHTNING AT SALINA, KANS.

At about 6.30 p. m., October 8, 1919, a brilliant display of ball lightning occurred at Salina, Kans., on one of the most frequented street intersections of the town. Eyewitnesses described it as "a ball of fire as large as a washtub floating low in the air." It struck the north-

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west corner of the Campbell Building, corner Santa Fe and Iron Avenue, about midway to the top of the building, which is 35 feet high, tore out some brick, demolished a second-story window, and then exploded with a bang that resembled the noise made by the discharge of a large pistol, filling the air with balls of fire as large as baseballs, which floated away in all directions. Some of these balls followed trolley and electric-light wires in a snaky sort of manner and some simply floated off through the air independently of any objects near by. An electric switch box across the street was ripped open and a transformer destroyed, leaving the east side of the town in darkness.

The street was practically deserted, as it was after closing hours and a heavy rain was falling at the time, and fortunately no one was near enough to be injured, though the display was seen by quite a number of persons.

This occurred approximately two hours after a tornado had struck the town of Hoisington, Kans., 70 miles to the southwest, and was probably in the same storm cloud from which the tornado cloud originated.

#### LIGHTNING DEATH DURING KITE FLIGHT.

Mr. Charles H. Heckelsmiller, laborer, was killed by lightning at Ellendale, N. Dak., on August 28, 1919, while assisting in a kite flight. Immediate efforts for resuscitation were made and two physicians were on the scene within 15 minutes. A severe burn was found across Mr. Heckelsmiller's chest and on the inner side of his right wrist. The kite flight was nearly completed and three of the six kites had been landed. It appears that Mr. Heckelsmiller was holding a splice wire in his hand and was standing close to the main kite wire when the flash occurred. At the time of the flash two employees were in the reel house and they state that the house was filled with flame. A line of sparks resembling a huge skyrocket was seen to follow up the wire<sup>1</sup> and these set the grass beneath on fire, as the ground was very dry, no rain having fallen for nearly two weeks. About 1,750 meters of wire were out at the time, and it was completely fused in the air. This is the first accident of its kind that has occurred to an employee of the Weather Bureau during the period of about 25 years, in which the Weather Bureau has engaged in kite observation work.—*Weather Bureau Topics and Personnel*, August, 1919.

#### DEATH BY LIGHTNING.

[Abstracted from note in Symons's *Met'l. Mag.*, October, 1919, vol. 54, p. 104.]

Dr. A. G. Newell describes an interesting phenomenon in connection with the burns received by a man who was killed by a lightning stroke in London. The man and his wife were walking in the open, near a row of elm trees, when he was struck. The wife was momentarily stunned, but upon recovering she saw her husband standing erect with a blazing line up and down the back of his coat. He died immediately, and fell backward against an iron fence. Severe burns on his back indicated that he was struck from the right side of his back.

<sup>1</sup> I observed a similar line of white-hot beads when about 1,600 meters of wire was fused by lightning during a kite flight at Blue Hill Observatory, Mar. 6, 1913. The thunder was an even peal, since the lightning producing it had followed the smooth curve of the wire.—*C. F. Brooks*.

From the right shoulder and across the chest and down to the lower of the front of the abdomen impressions of branches and leaves were clearly imprinted on the skin, showing like an X-ray plate how certain rays of light were impeded by the branches and foliage, whilst others made the contours of these. There were two distinct branches with leaves, one occupying the space between the right iliac crest to near the ensiform cartilage and the other proceeding down on the left side from the stomach to the left iliac crest. To my mind it would appear as if these were implanted while the man was falling back with a flash coming over the right shoulder.—*C. L. M.*

#### EFFECT OF LIGHTNING ON THE HUMAN BODY.

By DR. LADISLAUS VON SZALAY-UFJALUSSY.

[Abstracted from *Meteorologische Zeitschrift*, July-August, 1918, vol. 35, pp. 192-194.]

Those who are killed by lightning always have marks upon their bodies. A photograph of a dendritic pattern on a woman's back is reproduced. Where marks are lacking, there is some question as to whether they were actually killed by the lightning or by the sudden shock, which would result in heart failure or failure of other organs to continue to function. It is also true that in such cases the victims are generally found lying on their backs. This tends to give weight to the argument that their eyes were directed so as to see the lightning, and thus to cause the falling backward. The author strongly contends that the psychological element has a large influence on the fatality of the stroke, citing the cases where small children were uninjured, although the mother who held them in her arms was killed; and, also, the fact that sleeping or drunken people are less frequently victims of lightning.—*C. L. M.*

#### EFFECT OF LIGHTNING ON CONCRETE BRIDGE.

The *Engineering News-Record* of July 10, 1919 (pp. 68-69), tells of the effect produced upon a concrete bridge at Iowa City, Iowa, by a stroke of lightning on June 9, 1919. The bridge had a sidewalk between the roadway and a handrail, which was supported by half-inch steel rods, both laterally and longitudinally. The force of the lightning apparently acted between the handrail and the sidewalk, with the result that the handrail was displaced toward the north and the sidewalk toward the south, the rupture being 96 feet in length. One of the curious features noted was the pulling apart of the steel rods, and then freeing them from the concrete medium in which they were held while the pulling took place. This is shown by the fact that parts of the steel rods found in the conduit beneath the sidewalk were absolutely free from concrete, except for a very thin skin coat.—*C. L. M.*

#### LIGHTNING HOLES.

On the shore of Lake Congamond, Southwick, Mass., in July, 1917, Mr. R. Marsh states that lightning struck on the water's edge, making a hole about a foot in diameter, then went under ground 6 feet, and came out in another hole about the same size, throwing ashes to the tree-tops. Other branches of the lightning hole came to the surface in smaller openings.—*C. F. B.*